

AVIATION WEEK

A McGRAW-HILL PUBLICATION

SEPT. 12, 1949



Designers and builders of AIRCRAFT

U. S. Navy's PANTHER

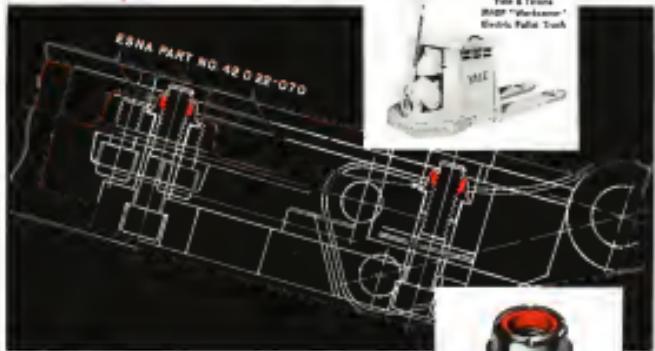
The Grumman Panther, the U. S. Navy's new carrier based Fighter, is equipped with one of the most powerful production jet-engines in the world. A worthy successor to the Navy's illustrious Grumman Fighters, the Wildcat and the Hellcat, this new, rugged Panther is superbly qualified to strike fast and hard wherever our fleets may be called upon to control the air.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGUE

Contractors to the Armed Services

Self Locking Spline Nuts

FOR COST-CUTTING
PRE-ASSEMBLY METHODS



—The Red Elastic Collar protects inaccessible bolted fastenings from failures due to VIBRATION!

After testing many types of fastenings, Yale & Towne selected ESSNA spikes, as the solution for the blind fastenings on the front and rear assemblies at the HESFC "Work Shop" Kinston, North Carolina. In this plant, the front and rear assemblies require almost 5000 of adjustments and rework weekly. Their research proved that cold striking assemblies at this application yields rapid strike generation against unnecessary down time... added insurance against over-the-the roofing, ... costly reworking operations are eliminated. The cold striking down rates with expansion type screw heads keep fastenings fully pre-tensioned at blind fastening locations, resulting in fasteners that are not stripped or broken.

The following is a typical example of the growing industrial acceptance of the **ESMA** option—especially for dry casting into steel gray iron, magnesium, or aluminum castings. By means of this simple technique, the operator is able to produce a desired number, *i.e.* a required casting, and the casting is expected to become the cast-off if it runs through

ELASTIC STOP NUTS



OVER 400 TYPES AND STYLES IMMEDIATELY AVAILABLE FROM STOCK

...for all your aircraft control needs



...cables...terminals...assemblies

This photograph suggests the wide variety in Macwhirter's comprehensive line of "Sole-Lock," "Socktype" and "Rigid" terminates. "Hi-Fasten" terminates are also available.

Cables and Assemblies

Commonly used sizes and types are regularly stocked; other "standards" and "specials" are made to order.

You can rely on Macwhorter for uniform quality materials which conform to A-N specifications.

Call a Macwhales distributor or send your

inquiries direct to Macwhyte Company. Catalog A-1 listing complete specifications is available on request.

Manufacturers of "Hi-Fatigue" Aircraft Cables
"Safe-Lock" Cable Terminals • Cable Assemblies
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"*Die Zeitung*" is a political broadsheet.



Typical of many Wyman-Gordon developments is this complicated light alloy forging used in the wing structure of one of Uncle Sam's latest fighting planes.

Modern transportation on the ground and in the air requires the maximum use of forgings. For greatest strength with minimum weight and uniformity of quality no other method of forming metal competes with the forging process.

Are you taking full advantage of the constantly growing range of forgings? Wyman-Gordon forgings all the way from five up to one thousand pounds.

Standard of the Industry for More Than Sixty Years.

WYMAN - GORDON

Forgings of Aluminum, Magnesium, Steel

WORCESTER, MASSACHUSETTS, U. S. A.

HARVEY, ILLINOIS

DETROIT, MICHIGAN



Planes and Pilots

ABOVE: The Goodfellow Tropic nose section projected outside the fuselage, resulting in the dimension losses which developed over the three-day period at the National Air Races. EIGHT: Thompson Tropic winner Cook Clinch (center right) is joined by runner-up Fredette and McMillan at the judges' stand, after the race which cost the life of Bill Odom III. LOW: McMillan's bigger propeller cover, designed to fit the Curtiss P-40, had to be lengthened after it was placed forward in the Thompson. One blade of the propeller was painted white, which gave spectators the erroneous impression that the prop was "spinning down" as the engine was not operating at full speed. All three Thompson winners piloted Goodfellow FGs, only 14 of which were entered by the Navy last fall, sold at angles.



Trim-Trol

DOES THE JOB
on the **LATEST**
BANSHEE

* Rudder Trim Tab Actuation

* Aileron Trim Tab Actuation

Selections of the "Trim-Trol" for Aileron and Rudder Tab Actuation on the XFB-1, P2H-1 and P2H-2 McDonnell "BANSHEE" was based upon the compactness and simplicity of installation combined with the inherent weight savings obtained by using the actuator for a portion of the mass balance.

We suggest you investigate the advantages of the "Trim-Trol" principle for your current designs.

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AVIATION CALENDAR

Sept. 12-16-20th anniversary meeting, International Transport Assn., The Hague, Holland.

Sept. 13-16-Fourth national instrument conference and exhibit, sponsored by The Instrument Society of America, Ref. Am. Institute, St. Louis.

Sept. 14-15-11th eastern division meeting of NASA, New York City.

Sept. 17-18-Aircraft Owners and Pilots Ass. annual convention, up-and-coming and travel conference, Sabbath Beach, Del.

Sept. 19-20-International Northwest Assn. Council convention, Spokane, Wash.

Sept. 22-25-45C-CIAA transport meeting, CIAA, 401 policies and interpretations, Ward Nichols, Washington, D. C.

Sept. 26-28-National Electronics Council meeting, Edgewater Beach Hotel, Chicago.

Sept. 28-30-19th anniversary meeting, Society News, Waldorf Astoria, New York.

Oct. 1-3-11th annual aerospace meeting and exhibit, Engineering Publ., Edgewater Beach Hotel, Los Angeles.

Oct. 7-9-Aerospace Air Mail Society, exhibit and convention, Edgewater Beach Hotel, Chicago.

Oct. 13-18-10th Reserve Assn. convention, Long Beach, Calif.

Oct. 17-21-19th conference on airport management and operations, sponsored by University of Oklahoma and Southern Flight Institute, Norman, Okla.

Oct. 17-19-80th annual convention, American Assn. of State Aviation Officials, New York City.

Oct. 18-19-16th NASA council meeting, Wright-Patterson AFB, Dayton, Ohio.

Oct. 30-Third annual San Francisco Assn. Fair, sponsored by Japan Chamber of Commerce, San Francisco Airport.

Oct. 30-Nov. 2-Annual convention, National Assn. of State Aviation Officials, New Orleans.

Nov. 3-12-Seventh annual meeting, Aviation Contractors and Manufacturers Assn., French Lick Springs Hotel, French Lick, Indiana.

Nov. 14-16-3rd Annual meeting, Society for Experimental Stress Analysis, Hotel New Yorker, New York.

Jan. 13-15, 1959-All-American Assn. Maintenance, Miami.

Mar. 6-8, 1959-47th annual meeting, American Assn. Lodging Ind., Hotel New York Hotel, Cincinnati.

Mar. 26-28, 1959-National Martin Reunion, sponsored by Society of the Flame Industry, New York, Chicago.

PICTURE CREDITS

7, 10, 11, 14-Robert E. Foster; 11—Walt White; 12, 13—Robert E. Walker; 10—McDonnell Aircraft Corp.

NEWS DIGEST

Aircouch Policy

Early action which the restructured domestic airlines may offer as much, if not more, benefit than long and often protracted negotiations during the coming year will confirm last week by the Civil Aeronautics Board.

* First-of-the-week double fares should be eliminated by June 30, 1959.

* Four continental coach service conducted with 21 to 24 passenger DC-10s probably cannot be successful unless it shows a load factor in excess of 85 percent—a figure likely to be attained over an estimated period. Accordingly, the Board said it would not grant an option beyond Sept. 30 to TWAY DC-10 coach service between Kansas City and Los Angeles or Cincinnati or Los Angeles or between Atlanta and New York City.

* Capital Airlines' "Nighthawk" flights from Washington and New York in Chicago and Minneapolis/St. Paul should be extended to June 30, 1959. Capital's request to extend "Night hawk" flights to the New York-New York hotel flights to the New York-New York.

* Trans World Airlines proposed New York-Miami coach service with 46 passenger DC-8s will be rejected.

* TWA's New York-Chicago coach flights with 50-passenger Boeing Stratoliners and Northwest Airlines' New York-Salt Lake and Republics' Chicago-Portland One-world flights with 50-passenger DC-8s will be approved for a transatlantic extension.

* Western Air Lines' proposed 60-passenger DC-8 coach service between San Diego and Seattle will be approved if departure times are limited to between 70 pm and 1 am.

DOMESTIC

Europe's Club-Air plan has been delayed from 5/5/59 to 5/5/59, Sander Aviation, Inc., announces. The Europe Standard is being discontinued for lack of interest in that model. There will be no change in equipment furnished with the Club-Air, except the price cut.

Transocean Air Lines' contract to manage, maintain and operate the Landing Aids Experiment Station at Atsena, Calif., has been extended to June 30, 1959. TAL has held the contract for the past two years.

* Two new squadrons of the Military Air Transport Service logged off the Pacific route on the Berlin airlift, according to efficiency ratings just released, during the five months the Navy planes and crews participated

The two squadrons were VR-8 and VR-6. Navy says its contribution is little, if any, to the Navy had more equipment sent per plane.

Seattle Chamber of Commerce is using a fund of \$75,000-\$100,000 to fight any proposal that Boeing Airplane Co. be moved from the city. Air Force has suggested that all future bomber work (which eventually will mean just about all Boeing production) be moved to Wichita on the grounds that the Seattle site is "unreliable" to an extent. So the whole Pacific Coast, says the chamber.

Military Air Transport Service is increasing several schedules, which were converted to make more planes and men available for the Berlin airlift. Pinwheel service will be attained before the end of the year. Reinforcement of Berlin airways begins Aug. 1 and will end Oct. 31. Normal schedules of round-trip reinforcement flights were restored Sept. 1. MATS' Creek Park, Minn., Arctic Replacement Training Center will now become a transport training unit.

Classes starting from Jan. 2 crash of a DC-3 owned by Seattle Air Charter have been rescheduled by Kleopis of London for \$115,000. Attendant took the lives of 11 Yale University students and is given 15 years.

INTERNATIONAL

Society of British Aircraft Constructors staged its annual show at Farnborough, England, with displays of latest jet and cabinetry types. Three new jet fighters were disclosed: Avro 707, a multi-wing type which flew for the first time just before the show opened and which is believed to be capable of supersonic speed; de Havilland 112 Viscount, a revamped Vampire, but with a Chestnut engine; and the Gloster 109, a fighter derivative of the Hawker 109, a single-seat fighter.

Boeing's what-captain-can-do testing made in G-E aircraft was performed (2) remarkably high immunity to effects of flame and heat, (2) high moisture resistance, because the silicon acts as a barrier to the aluminum fibers and (3) unusual vibration resistance, because the plane has the same protection of silicon varnish.

The Italian heat-treating Distributor Soc. Italherm makes and carries designed for power, lighting, and communication systems, and for conveyor service. It provides 100 to 1,000 degrees of surface heat-treatment, which consists of high-quality glass-bond, and G1 overall, silicon-coated steel.

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Here's one more answer to the problems encountered when aircraft wiring must withstand high ambient temperatures, such as engine exhaust streams. General Electric's

new what-captain-can-do testing made in G-E aircraft was performed (2) remarkably high immunity to effects of flame and heat, (2) high moisture resistance, because the silicon acts as a barrier to the aluminum fibers and (3) unusual vibration resistance, because the plane has the same protection of silicon varnish.

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GENERAL ELECTRIC



As simply as this

they lick a high-temperature problem

Problems a plugging to seal the exhaust-manifold of aircraft engines used to be quite a problem.

Corrosive, fuming gases quickly charred ordinary platings. While materials that could endure the heat, soon deteriorated under the intense vibration.

But . . . Johns-Manville engineers found a material (and a method of using it) to tame this triple threat of heat, corrosion and vibration.

Logically enough, they chose a material known for its great thermal resistance . . . ceramic.

They had thin slabs of this INCO Nickel Alloy cast into seals and then tightly braided around an exhaust manifold. **Result: a J-M packing**

that stubbornly resists the searing attack of hot, corrosive gases.

Perhaps one but one of the many ways INCO can help safeguard air travel. Consider: 80 per cent metal and 24 per cent ceramic. INCO gives you superior resistance to heat . . . corrosion . . . vibration . . . **ceramic.**

Because it is easily available in all standard mill forms—plate, strip, coil, tubing, wire, screening—to be fabricated into your designs. (Frequently, a switch to longer-lasting ceramic means a savings, lighter weight.)

Remember, if your problem is high temperature, corrosion, or vibration, it's probably in one of INCO's *Alloys* or *Castings*. **Send for your copy of "Engineering Properties of INCO,"**

THE INTERNATIONAL NICKEL COMPANY, INC., 40 WALL STREET, NEW YORK 5, N. Y.

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WHO'S WHERE

Changes at C.W.

Gormont-Wright Corp. has filled an exciting job and created a new one: George R. Hilt, formerly of the accounting firm of Lybrand, Ross Bros. and Montgomery, has been named controller, succeeding the late Raymond J. Weller, who died suddenly July 2.

The new job has been given to Robert J. Rade, who is senior vice president. Appointed to it is Leslie Neale, former editor of *Aerospace Materials*, and lately director of the Standard Accounting Index, whom joined the firm in 1954. CW personnel development is the responsibility of Mark Neale, a management trainee at Mark Neale is public relations manager.

Promotions

Cliff Edwards has been elected a vice president of the Wards Motor Co. and assistant general manager of the Wards division. He has been selected vice-president and director of the Wards literary division. Clyde Shantz, chief accountant at Wards, takes over Shantz's old job.

Robert MacDonald, a director, was elected president of MacLeod Roy Aircraft, Ltd., Winnipeg, according to the late Gertie MacLeod.

Thompson Products, Inc., honored Stanley F. Rydel as sales manager of the aviation division to director of sales staff. With Thompson since 1932, Rydel has spent several years as assistant sales staff and is the new post will accommodate his contacts with Thompson's aviation customers.

New Jobs

Edward G. Beck has joined Pan American Airways as radio manager. He formerly was general manager of Hughes Aircraft Co. and a vice president of American Air Lines. He succeeds Nathaniel Gross, who resigned as radio manager. Christopher De Garmo, general traffic manager of Pan American, also resigned.

D. B. Hawley has been assigned to the newly-created post of manager of sales and marketing communications for Northeast Airlines. He joined NWA as a radio operator in 1937 and recently has been supervisor of communications for the Eastern Region.

Gordon Conant has resigned as managing editor of *American Aviation Daily* and has it with PMA & Koenig, Inc., as editor of *Passenger*, publication of the American Airlines trade press.

Neil Shibley has resigned as managing editor of *American Aviation Daily* and now is managing editor of *Commercial Aviation*, a monthly trade journal. **John W. Morris**, formerly with the Port of New York Authority, has joined the New York office staff of Dick Aerwest.

Frank X. Bunker is the new assistant sales manager of Radio Frequency Laboratories, Boston, Mass.

INDUSTRY OBSERVER

► Cook Cichak, 199 Thompson Trophy winner, claims 4000 hp. from his Pratt & Whitney R-4360 Wasp Major engine. This power is developed at 65 hp. at 2800 rpm, using hydrocarbon particle injection. This latter fuel is claimed to be a "stabilized" form of gasoline which, upon decomposition, becomes water.

► Attention focused on Cleveland and plates, fitted to his prize-winning Goodyear F-52 Custer, was largely simplified. The stabilizers was efficacious not in added speed (he averaged only 1 mph faster than year three personally but not visibility of the cockpit. The plane's wings, after being clipped 15 to 20 percent, were cut an additional 20 to 30 in the year's race, resulting in greater instant roll-over. The end result, by providing an increased effective aspect ratio, gave the plane good handling characteristics, with the slightly reduced drag of lowered tip loads.

► Bill Odeon's Johnson North America A-56 "Bogart," on which 1000 hours from 550,100,000 are measured to have been spent, had tips and wings clipped 25 percent to make room for the swing-cockpit tail stabilizers. This saved his stock floors to critical valves. Odeon flew the trim, great speedster at the summer of poles more of 10 years ago, with many refined tools and shop leveling-off techniques. The combination of the two, together with gauges and prop wash of preceding pilots, created an overwhelming plotting job which few could have mastered. The tip-stabilizer installation was predominantly accomplished by North American engineers and not only did not cost the engine bay at all but actually added a flight amount of thrust.

► North American has adopted Republic's droppable fuel tank for after the use of horizontal fuel as on the two 200-gal tanks Republic P-47s originally had. The new tank is placed under the belly below the fuselage, and the use of the wing box fuel tank installation is basically a device to hold the tanks in steady flight over water.

► North American F-86 fighter flies the jet division of the Thompson Trophy Race in a steady bank which held a constant 67 G on its pilot; an acceleration curve considered the maximum ever for test pilots, but now a standard, untrained lead for a殉eronome race. Highly turbulent air gave sharp edge-on loads producing 5.9 G loads. The nose could not have been flown without an 18% margin.

► Both the military and civilian pilots used oxygen during the closed course race of the 1948 classic, even though they flew only a few feet off the ground. All pilots confined that oxygen gave them the "lift" necessary to overcome fatigue on the grinding course. Since used at high as 150 ft. from their decompression systems.

► Pilots of the P-51s while convinced that the airplane is capable of reaching a ceiling of 70,000 ft., are not anxious to take it up to that altitude due to the personal dangers involved. Since the Vultee Model 60 has a 65,000 ft. ceiling, it is considered safe for jet pilots for the addition of altitude pressure. Explosive decompression at an altitude higher than 60,000 ft. causes "pilot oxygen" which is a decompression sickness during which a person's body cannot tolerate the pressure of these altitudes without losing a man's ability.

► Only mechanical failure of the plumbing Thompson Trophy race was that of Alton Johnson, last year's winner, in his strangled-down North American Mustang fighter. Johnson left the race, after losing several exhaust stacks and substantial quantities of oil. He noticed the oil streaming from the engine and, despite the fact that the oil pressure and temperature gauge indicated satisfactory conditions, he decided to risk his equipment no further. Johnson had removed the engine oil installation, which worked perfectly, so long as he stayed at a standstill.

► One of the top-stopped fighters and fastest in the Thompson Trophy Race is a Republic Seafighter NF-14 powered by a 2300-hp. Rolls-Royce Griffon engine. Please to H. H. G. MacArthur, RCAF pilot, the aircraft was constructed from its factory-delivered configuration for the race, including installation of VHF radio equipment. The aircraft exhibited at about 170 mph, which its pilot claims to be about 10 mph under the conditions existing at the race. Faster quotations of 325 mph, top speed were termed by the pilot "an exaggeration."



From the National Air Races . . .

ABOVE: Lt. W. C. Rice, the winner of the All-American Dr. Ross, receives his trophy from Mrs. Madlyn Webster, widow of the late Dr. Ross. LEFT: Mrs. Madlyn Webster presents the trophy to Rice, suspended from the field by the Bell crane. BELOW RIGHT: Bill Gause is shown rounding the pylons on his first

lap in the Abbott Thompson Race. BELOW LEFT: Goodwin winner Bill Beeson is greeted at the start line by owner Bill Beeson. BOTTOM: Racers on board the Sabre Triplane Race are lined up in the race-line area, which was used the week of the races.



AVIATION WEEK, September 12, 1949



. . . At Cleveland

ABOVE: Cook Cleveland's F4U, winner of the Thompson, after the race. RIGHT: Paster entry in the Goodwin Race. MID-LEFT: Bill Robinson, who piloted Little Tom, is greeted by owner Tom LeVier, who did not enter any of the races. The cart pulled out of the Cleveland when it became stuck in the mud. BOTTOM: RIGHT: Lt. Goss South flew the modified entry to fourth place in the Goodwin Competition. BOTTOM: Cook Goss demonstrates a man-lift on arrival with the Paster biplane.



AVIATION WEEK, September 12, 1949



B

F-86 Speed Runs Steal National Air Races

North American jets exceed critical Mach over closed course.

By Stanley L. Colbert

CLEVELAND — North American F-86 Sabre, chief attraction at last week's National Air Races, have exceeded 710 mph and 72,000 ft altitude in flight tests.

The Sabres, top planes in U. S. Air Forces fighter rifle, were chosen to the American entries for the first time in appearance and racing order. This was the second year that the swept wing craft had top honors at the Air Races. Last year, in modified world speed record tests before the crowds, the F-86 reached 665.400 mph in level flight, piloted by Major Richard L. Johnson.

Four F-86 Sabres, two from MacDill AFB and two from Langley AFB, were scheduled to participate in the first division of the Thompson Trophy Race, but only two of the planes—both from the Fourth Fighter Group at Langley AFB—actually took off. One Sabre did not get off the ground, the other dropped out when the rear mainwheel, front drooping, the pilot too low to afford adequate visibility.

► **Wingman.** Capt. Bruce Cunningham, who this year piloted the swept F-86 at an average speed of 584.175 mph over the 15 mi. course of 535.165 legs, finished the race after he had lost all but a slender amount of his fuel tanks. All rests on the racing side of the clewels had popped and shot around the tippe of the Sabre was wrinkled.

Capt. Murray C. Johnson, only other pilot in the race, had reached the course at 550.152 mph, and avoided the racing tip at 554.444 mph.

Both Sabres were loaded with 43 gal. of fuel and when the race started, had fuelled with another 43 gal. from the Sabre's indicated rate of 70 gal. While the top-speed Thompson course covers only 225 miles, the Sabres actually flew nearly 250 miles instead of 15 for each of the legs. Both planes landed with about 20 gal. left in the tanks.

► **Swift Decoys.** The F-86 pilots were racing over the indicated Mach num-



ber of .95 on most of the racing legs. The planes are capable of a climb at 60,000 ft in 15 sec., and a dive to 50,000 ft in the click of 25 sec., with speed.

Last year AVIATION WEEK reported exclusively that the XF-86 had reached超音速 speeds during dive tests, a fact later verified by USAF. Since then the type was exhibited in each event, a system many aviation people would like to see adopted on U. S. open contests.

In one of Johnson's races, the Bucker P-104, Vampire 3 and D H 108 were pitted against each other. Several events were held for the various types and scales of personal planes, such as the German, Cessna, Piper 1 and 33, Hawk, Tandem, Miles Messenger and Monocoupe.

Earlier, in demonstrations by the USAF and Navy, more than 175,000 Labor Day weekend spectators were treated to performances of jet aircraft from the USAF, Navy, along with USA's Lockheed, a racing team of the Piper PA-11, and the Air Force Hostel Rover team. The PA-11, after circling the field of the grandstand, swooped over the crowds and sprayed them with gallons of Jacqueline Cochran's "Skin Tight" perfume.

Weather followed the pattern for Labor Day weekends in Cleveland with at least one day of rain. On the first day, heavy winds upset the scheduling of many and events that while F-86 pilots bemoaned the tube length, Bill Brewster, winner of the Goodyear Trophy Race, told AVIATION WEEK he was not bothered at all by the wind.

► **Speed Possible.** This year's Air Races, evidently intending to the general public, did little to further industry knowledge of the comparative qual-

ities of each type competitive aircraft. Last month, in Great Britain's first National Air Race, no two aircraft of the same type were exhibited in each event, a system many aviation people would like to see adopted on U. S. open competitions in view of the fact they cost.

Capt. William Odom, holder of numerous record world and long-distance non-stop flight records, ended his death in the second leg of the Thompson Trophy race.

► **Race.** **None.** —The 1960 National Air Races, as well as from Cleveland as a result of record downing in the recorded series downed at Cleveland Airport following the Cessna crash, was reported at the pilot's meeting following the race.

Bruce Frewinkle, NASA General Manager, told the pilots that his organization had received from the Federation Aeronautique Internationale to compete in the races in 1970, but that the present race management might move the show. At least two other cities, Dallas and Houston, already have put in bids for 1970.

Fredriksson of the United Press of Canada said, "After what happened yesterday, it's possible that the saboteurs will try to obtain injunctions against the races. We'll just have to wait and see what happens."

► **Closed.** **Wing-Corral.** Capt. Collier, Willsboro, N.Y., aircraft operator, and 1967 Thompson winner, rode

on a monoplane with the de Havilland Vipers, members of the Royal Canadian Air Forces 403rd Fighter Interceptor Squadron, commanded by Flight Lieut. W. B. Tees.

Speedy acts included a mass demonstration by a Coast Guard P-3C with Pilots HRFB, flown by Capt. Frank Enders, who devised the formation gear on the copilot flight by the press pilot position. Wipers, aerobatics by Betty Strehle and Steve Haward, and a "one" between two vintage 1930 Curtis racing planes.

End of Races?

Odom crash again raises question as to value of airplane speed contests.

By Alexander McSorley

CLEVELAND—A tragic ending to the 1969 National Air Races increased a famous pilot, a mother and a child as the after of speed and again raised the question of the value of air race competitions in view of the fact they cost.

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All images are from the 1969 National Air Races. All photos provided by Goodyear Aero.

Goodyear Trophy Race

Place	Pilot	Entered	Elapsed Time	Speed MPH
1	Wm. Odom	S. J. W. 20000	7:00:30	177.501
2	Rich Stevens	Keith Stevens	7:00:58	178.758
3	E. J. Morrison	S. J. W. 20000	7:00:91	178.244
4	Wesley All	Glenn Patterson	7:00:61	175.874
5	Murphy Johnson	Edgar & Anna	7:00:21	175.723

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Allison Jet Trophy Race

Place	Pilot	Entered	Elapsed Time	Speed MPH
1	L. M. Miller C. New		7:15:55	176.884
2	1st Lt. F. N. Fugate		7:16:33	176.907
3	1st Lt. F. F. Colonna		7:16:57	176.941
4	Capt. G. J. Stevens		7:16:42	176.821

All images are from the 1969 National Air Races. All photos provided by Goodyear Aero.

Tinnerman Trophy Race

Place	Pilot	Entered	Elapsed Time	Speed MPH
1	E. W. McElroy, Jr.		18:15:10	364.069
2	W. F. Mitchell	S. A. W. 20000	18:15:49	370.730
3	J. H. McRitchie	Spiral	18:15:22	369.585
4	J. B. Harrelson	Lockheed F-104	18:16:29	370.179
5	J. P. Haggstrom	Lockheed F-104	18:15:18	361.958

All images are from the 1969 National Air Races. All photos provided by Goodyear Aero.

Sohio Trophy Race

Place	Pilot	Entered	Elapsed Time	Speed MPH
1	William Odom	S. A. F. 20000	18:15:28	364.865
2	Tom Poberezny	Goodyear F-104	18:15:16	364.836
3	Charles Taitan	Ref. F-101	18:16:16	361.127
4	Steve Steele	S. A. F. 20000	18:15:49	370.719
5	Ken Colley	S. A. F. 20000	18:15:22	371.417

All images are from the 1969 National Air Races. All photos provided by Goodyear Aero.

Thompson Trophy Race

"R" Division

Place	Pilot	Entered	Elapsed Time	Speed MPH
1	Colin Collier	Canberra F-104	18:15:10	361.073
2	Tom Poberezny	Goodyear F-104	18:15:11	361.317
3	Richie McElroy, Jr.	Goodyear F-104	18:15:12	361.339
4	Steve Steele	S. A. F. 20000	18:14:49	361.316
5	Glenn Trotter	Ref. F-101	18:15:03	370.397

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Bendix Trophy Race

Place	Pilot	Entered	Elapsed Time	Speed MPH
1	Joe Collier	S. A. F. 20000	4:15:27.1	478.135
2	Stanley J. Stevens	S. A. F. 20000	4:15:27.1	478.221
3	Howard Johnson	S. A. F. 20000	4:15:27.1	478.216
4	Don Poberezny	Deferrari Monoplane	4:15:27.1	478.237

All images are from the 1969 National Air Races. All photos provided by Goodyear Aero.

Thompson Jet Trophy Race

Place	Pilot	Entered	Elapsed Time	Speed MPH
1	Col. E. B. Ladd		3:45:07.2	340.873
2	Col. Cody W. Bogen		3:45:08.1	340.893
3	1st Lt. S. B. Johnson		3:45:08.1	340.776
4	1st Lt. E. B. Bogen		3:45:08.1	340.803

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Bendix Jet Trophy Race

Place	Pilot	Entered	Elapsed Time	Speed MPH
1	Mac Vernon Ford	120-034	3:45:00.0	340.747
2	Capt. J. W. Newman	120-030	3:45:00.0	340.747

All images are from the 1969 National Air Races. All photos provided by Goodyear Aero.

sampled, of course, with expert printing.

America's aerodynamicists again blazed many exhausts of choices at the Goodyear Trophy. Many aircraft were obviously saving their owners' money and their pilot's time in the use of point-and-shoot instruments, seemingly crude but amazingly accurate.

■ **Sikorsky Switch-Hamers** ("Fus") did more, for example, attempted to impose on the classic lines of the Cessna Wind series of aircraft designed by Glass Fauske. Lockheed's aerodynamicists, by using the wing and substituting a tail tube fabric-covered fuselage, which placed him fifth overall but had a standard Cessna Wind piloted by Vincent Art Salomon, had done an excellent job in cylinder-head fitting and canopy installation but lost all these advantages by a strenuous fuselage and engine configuration.

Only unique new Goodyear entries that year deserved the title of "best design" alone, were the two-seat monoplane of the Lawrence Institute at Techademy, Detroit, piloted by Carl Ambler. Despite outstanding pilot's job, the gleaming white surface was slowed by poor panel design. In addition to the obvious disadvantages of panel installation, the station designers failed to appreciate the vital importance of detail design and finish in speed contests. Despite disengaging tail wheel installations on both lower fin, roughly hewn were added, as well as conventional fabric and formed metal skins that was poorly emerged.

Planes were due to be completed in time to compete they can feel the very best. Standard GM Co. of Ohio furnished all Goodyear entries with 100 gal. of either 90 or 91 octane (fuel only) for speed trials but the latter due to its slower kick of acceleration), and high pressure tires with 400 psi of a special racing blend compounded especially for the contests. Salomon proposed 1.10/17 octane fuel, containing 4.44 total lead and with 100 octane content of 90.900. But jet 2000 Duluth and Alvia Morris used regular fuel to which they added about 4 total lead.

■ **Fuel Injection**—All were equipped with fuel injection, although it was not used in all cases. Standard Pratt & Whitney's 50-50 gasoline-alcohol water injection fuel was run by Ron Paulart and Ben McRae in their Wasp Major engine. Cook, Cleland had equipped his flying racing Cessna for "50-50s". Hydrogen peroxide injection but a little report indicated that this was not used in the race. Reckoning rates used water-alcohol injection in 40-60 ratios with adiabatic rates varying from 1.9 to 2.5 psi/ft. An indication of the quantity (and weight) water required is given by the overall hour required for the race.

P. O. Studies Air Star Routes

Post Office Department is making a survey to determine what air mail routes to inaugurate under recently-enacted legislation authorizing the service. Contracts for the routes will be let

by competitive bid. All types of mail will be transported. Star routes paid being certified airmail routes are barred.

■ **CAB Notified**—When the Post Office decides to establish a route, the Civil Aeronautics Board will be notified before bids are called. The Board will have a 30-day period in which to consider the proposed new service and can veto it if it daunted at a change route with the certified airmail rates.

Post Office officials estimate that about a dozen air mail route awards will be made over the coming year. These will be in areas where airmail transportation is difficult. The Pacific Coast region, the Great Lakes region, the Great Canyon and other mountainous areas have been mentioned.

The department is now operating two domestic air star routes in the Great Lakes region. Until the new air mail route legislation was enacted authorizing an unlimited number of domestic routes, the department was limited to five.

AA-Delta Interchange Gets Temporary OK

An equipment interchange agreement providing through-shipments between American Airlines points west of Dallas and Delta Air Lines' points of Dallas has been approved temporarily by the Civil Aeronautics Board.

The decision will permit interchange schedule over a northern transcontinental route from Miami, Jacksonville, Atlanta, Birmingham and New Orleans to Los Angeles and San Francisco.

Under the interchange agreement on Dec. 1, 1947, with standardized equipment with the required ideally American will furnish four planes and Delta two.

Under the interchange agreement on Dec. 1, 1947, with standardized equipment with the required ideally American will furnish four planes and Delta two.

■ **Planes on Lease**—At each of the places passes the exchange point (Dallas), it will, under the agreement be under lease to the connecting carrier. Captain assigned to the interchange flights will be authorized to determine and accept delivery of the leased planes.

■ **Pilot Made-Easy** and National had protested that even temporary approval of the American-Delta equipment interchange would prejudice their bids for a southern transcontinental route. They argued that interchange service is not a satisfactory alternative for emergency service. CAB agreed NAC and EAL that approval of the temporary interchange will not affect selection of the southern transcontinental route.

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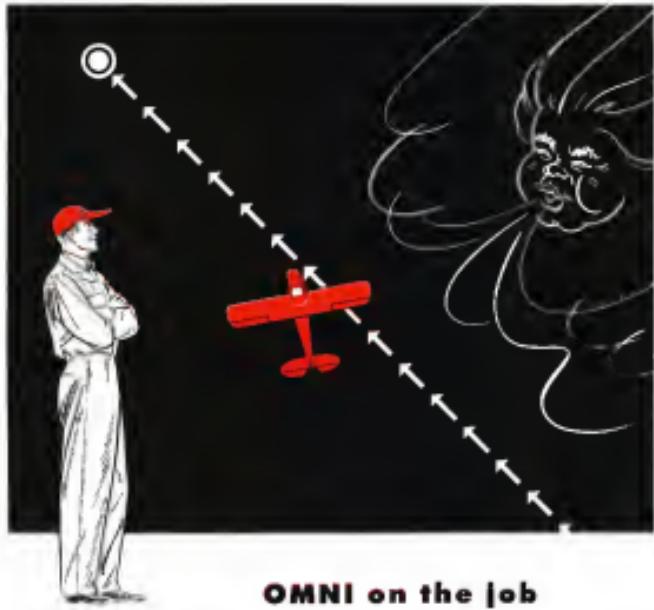
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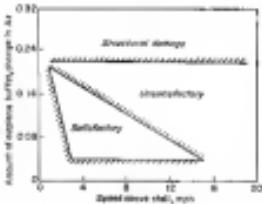
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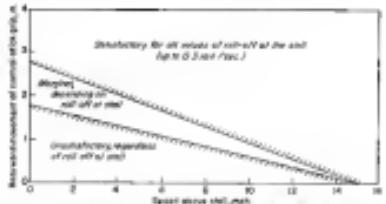
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CORRELATION of pilot opinion of stall warning with airplane buffet (Fig. 1, left), normal aircraft of stick (Fig. 2, right).



Summing Up Findings on Stall Warnings

Pilots' reports on stalls correlated with readings from special instruments to set up design criteria.

One of the most important research projects on aviation safety was the establishment of quantitative design criteria for developing the flying qualities of aircraft.¹ This study induced pilot opinion to mathematical ranges useful for design and placed the range of good handling qualities into a set of airplane on a refined basis for the first time.

It is now possible to compare all of the flying qualities with specific quantitative requirements except one—stall warning.

► Stall Warnings—Current flying qualities specification states that approach to the stall must still be accompanied by a distinct stall warning consisting of one or more of the following: (1) buffeting and shaking of the airplane and controls, (2) increased沉降 of the control column or marked increase of control force for further speed reduction, and (3) progressive dislocation of the stall through nose-upgrade pitchup and rolling motion.

The experiments also state that the stall warning shall occur at a speed not less than 1.05 or more than 1.25 times the stalling speed for each of the various flight configurations.

With the exception of the limits of stalling speed, none of these requirements provide the designer with any quantitative data to go by in the layout of the airplane.

Obviously, it is to meet these requirements that must leave: (1) Amount of airplane buffeting, (2) amount of stick shuddering, (3) amount of elevator shake, (4) amount of elevator

buffet, (5) maximum amplitudes of roll and pitch velocities, and (6) moment of change in aircraft bank position and control force prior to the stall.

► NASA Investigators. To provide answers to these questions, the National Advisory Committee for Aeronautics obtained data on 16 airplanes, ranging from single-engine fighter to four-engine heavy types, flown by four research pilots having varied backgrounds.

Instrumentation was installed in the airplanes and pilots' notes made in which opinions of the stall warning were compared.

By comparing pilot's opinion with data obtained from the instrumentation it was possible to get quantitative answers for the questions asked.

One of the first problems guaranteed by this approach was a complete lack of correlation of pilot opinion concerning several of the questions asked.

For example, control shuddering shown by the elevator control position reader did not give a good indication of the initial loss of the control stick as perceived by pilot, probably because of pitch and roll control on the control system.

Another area eliminated was amount of buffet shown by the force variation at the control stick grip. This showed an anomalous correlation with buffet at shaking of the controls, possibly because of friction in the control system and the fact that the force recorded depended upon aircraft supplied by pilot.

► Correlation. Only items found which produced consistent quantitative measurements and could be correlated with

plot observations of the stall warning were normal accelerations of roll velocity and elevator control position. Fig. 1 indicates the buffet location of the airplane approaching a stall in which pilot opinion indicated buffetting and stickshaking conditions.

These data were obtained by an accelerometer and the readout used is the moment of normal acceleration factor A_n . Incremental value of A_n measured at the first point of buffet was approximately 0.04, apparently the smallest change in acceleration that pilot could detect.

His ability to detect the lower limit of buffeting is influenced by a number of factors, such as frequency, phase, degree of other forces, whether or not he is aware of the noise. In this regard, jet aircraft would possibly offer more ideal conditions for detecting stall warning produced by buffeting.

► Dependency. Factors—judgment of whether the stall warning is satisfactory at the first indication of airplane buffet is dependent not only on the initial amplitude but also on the speed above the stall at which buffeting begins and how rapidly the buffet increases in amplitude with decreasing speed.

Again, the results of Fig. 1 indicate that buffeting did not occur until a speed of approximately 15 mph above the stall the buffeting was received so far from the complete stall as to serve as a satisfactory warning of the approaching stall.

Another interesting aspect of the early buffeting is that it might build up to such great magnitudes as stall is approached that the pilot from structural damage to the airplane (upper region of Fig. 1).



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The first controllable trim tab in a U.S. fighter plane was on the Consolidated PB-2A "Boeing" model design, which appeared in 1935. The first aircraft to use trim tabs was the Spite-Lawson Curtiss XP-30 Swift, which in 1931 used balance tabs on the ailerons and the elevator. The Republic P-35 fighter of 1938 featured dive, aileron and the elevator and rudder, the Curtiss P-36, the following year, featured the rudder and elevators.

Testing also pursued in the Navy fighter field with adjustable trim tabs on the XP-TB-1 at 1933. The Curtiss PTC of that year also provided adjustable trim on the elevator. The Curtiss XP-12C-1, a test fighter, had the first true controllable trim tabs ever shown. The Curtiss XP-11 fighter of 1935 introduced controllable trim tabs as an 11th radio.

Since these pioneering applications, the use of control surface tabs has grown to complete and important until by the beginning of World War II it was a universal feature of high-powered aircraft of all types throughout the world.

► **Definitions**—Because of the wide variety of tab forms and arrangements, it is convenient to classify them according to basic function without reference to individual methods of operation or linkage systems.

► **Trim tabs**—This is a movable portion

of a control surface used simply to trim the airplane to straight, level flight in such a manner that it may be flown hands off.

► **Balance tabs**—This is a movable portion of a control surface that is balanced with respect to static load, such a manner that it moves in an opposite direction throughout the range of motion of the surface in which it is attached, and serves to adjust the pilot effort required to operate the control.

► **Stress tabs**—This is a movable portion of a control surface which is linked to the cockpit in such a manner that the tab directly controls the airplane through movement of the surface to which it is attached.

Here is a wide variety of sub-division of these main classifications. For example, the trim tabs may be adjustable on the ground only or controllable from the cockpit; the balance tabs may be made controllable from the cockpit so that it functions both as a trim and a balance tab; a special tab may be inserted in the servo tab which counteracts the servo tab as a balance and a servo tab. And other combinations are used.

► **Stress for Dope**—The principal contribution of the Wright Brothers to aviation, it is often claimed, was a means of controlling an airplane in flight. The Langley machine had no control surfaces other than a vertical rudder, which later tests proved not十分. Early designs, both powered aircraft and gliders, had either no control surfaces or systems obviously made quite in power.

A major portion of subsequent man-made history was occupied with research and development of stability and control characteristics. The two qualities are closely interrelated, but of the two, stability is much more amenable to mathematical treatment and, therefore, to rigorous design analysis.

Control has been largely a means of safety and not an end until 1941 that quantitative appraisal of aircraft stability characteristics was reduced to the necessary derivatives and coefficients much to the satisfaction of all.

Following this important reduction of test pilot opinion to actual design data, it became possible for the designer to give a new airplane stability and control characteristics that would insure safe flying qualities without pilot fatigue or discomfort. However, the high cost of flight testing gave rise to a wide variety of opinion. The second major test step in the present was to find out how much strength a design had to start in flying an airplane.

► **FM4**—Eliot—Several approaches to this problem have provided important data, but one method still remains to earn military and civil agencies, and



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between the U.S. and British interests are. These data, however, do not allow the evaluation of:

- Control moment effect of which a pilot is capable
- Maximum effect reasonable over a short period of time
- Control effect pilot desires to exert over a period of time

Generally, these three figures differ by a factor of two in each case if the first is 100 lb, the second is 50 lb and the third is 25 lb.

There are other specific control forces beyond which the pilot feels as comfortable, attend fatigue and, in the extreme case, inadequate strength to deal with the situation. These are the basic design considerations towards which the engineer works in the layout of the airplane and its control system.

• Control—This is only one speed at which the airplane will fly without a force being applied to the control. At this maximum speed, any deviation from this speed will require a pressure on the controls in order to hold the airplane in steady level flight. A change in the e.g. of the airplane, the power of the engine, etc., requires a change in control forces.

In order to measure the range of e.g. and power conditions over which the airplane would fly "hands off", designs are carried by an adjustable stabilizer at the leading edge of which would be moved or lowered through a cam in the cockpit. Slight changes in this stabilizer position balanced out the unbalanced force and reduced the control forces to zero.

This device, while mechanically simple too, was structurally complicated and expensive. It was to eliminate the adjustable stabilizer that the trim tab first came into use.

• What Tab Does—Assume that the airplane e.g. is slightly off its design position, resulting in a slight roll moment to the airplane and the necessity for the pilot to hold the stick forced slightly in order to maintain level flight.

The trim tab is a small movable arm of the elevator located at an enormous distance from a spanwise direction. The small arm is deflected upward, creating a downward air current that rotates the airplane.

The product of tab angle, tab size and distance of the centroid of that arm from the elevator hinge line is equal to the product of elevator area times centroid of elevator arm from the elevator hinge line. When these two products are equal, the total static force is zero, and the elevator will rotate in its slightly down position without further action from the pilot.

This is the simple principle of the trim tab. This relationship applies to the aileron and stabilizer as well as the



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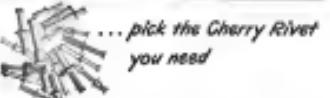
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clearer. From tabs equal control force is easy to trim out any undesirable moments in the system. They are removable and are used only for aircraft trim.

► **Balance Tabs**—In aircraft, the trim tabs must be manipulated rapidly, as the trim tab system is used. Control tabs during maneuvers in a given airplane vary with the degree of deflection of the control surface and the velocity of the aircraft.

So far it has been shown that there exists a maximum control force which the pilot can exert; it follows that for a given control deflection there also exists a maximum trim speed beyond which the pilot cannot move the control to the required angle.

To solve this problem, a small longitudinal section of the control trailing edge is fastened to a fitting on the surface to which the control is attached. When the control is displaced, the tab moves in the opposite direction, inducing the control force produced by the control displacement.

Since the degree of displacement of the balance tab is proportional to the degree of displacement of the main surface, the degree of balance can be varied with control displacement, resulting in substantially reduced static force per degree of control displacement.

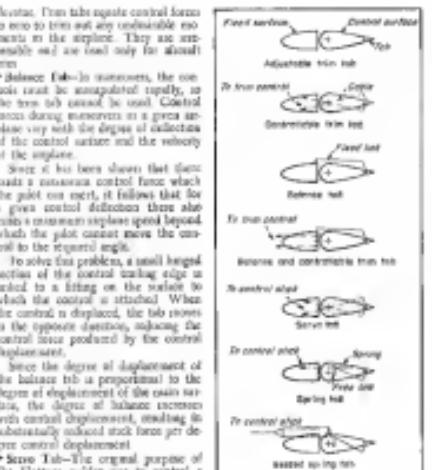
► **Trim Tabs**—The general purpose of the trim tab is to control a step through operation of the rudder tabs only, the saddle still being free to move. Thus a small force with a long moment arm is made to do the same amount of work of a large force with a short moment arm.

The principle of the servo tab has been applied to a number of airplanes experimentally, notably in England, but its main drawback is its lack of effectiveness at slow speed. Trim tab effectiveness when deflected more than about 20 deg. Since logic control surface deflection is required at slow speed, large tab deflection will be required and trim tab effectiveness is easily lost.

Another British contribution to tab design is the option of a spring into the servo tab system.¹ The pivot control cable is connected to one end of the spring, the other end being fixed to the surface control. The control cable is attached through a link to the tab.

This arrangement increases the low speed deflection maintained above zero, at low speeds, the spring force is a very large compared to the cable force and the surface is moved, as offset, as a plane, mainly controlled surface. At high speeds, when the aerodynamic load is large compared to that of the spring, the arrangement functions in effect, as a servotab.

An improvement over the spring tab has been made by W. H. Phillips, of the



These deflection must be lengthy and expensive changes in length, cost and surface leading edge profile or even such crude but obvious methods as shortening aerofoil until the "right" combination is attained at random. The same difficulty is experienced in applying a damaged aerofoil or chord with a new leading edge.

And this problem cannot be solved economically simply by the tightening of manufacturing tolerances. Aerostatic control surfaces cannot be built with say 1/16 in. of accuracy under mass-production methods with the purchase of a fine watch. It is an effectively "losing" these errors. Flat spring servotabs have an important application, since they reduce the necessity for dynamic balance apparently. In the case of power-operated servotabs, they render any form of balance unnecessary.

► **Control Requirements**—From qualitative requirements it is clear that the elevator control should be sufficiently powerful to hold the aerofoil off the ground in an attitude permitting a fully stalled landing with a slight pull force not to exceed 10 lb.

Control aerofoil requirements is that at any speed below 80 percent of maximum level flight speed it should be possible to obtain a value of g/V^2 (i.e., maximum roll-off velocity in radians per second), V , being speed and V_0 being assumed in level flight at 80 percent with a wheel force of not more than 83 lb, and a stall factor of not more than 1.5.

Control aerofoil requirement is that at all speeds above 1.5 V_0 (rolling speed) the control tab be powerful enough to provide equilibrium of rolling moments in non-tightening aerofoil, with one again not exceeding the remaining engine developing full rated power with pedal force of not more than 168 lb.

► **When Trim Tabs Needed**—Trim tabs are essential when the airplane design does not match these control force requirements. However, trim tab design is a simple and straightforward job outside. In fact, trim tabs were in use seven years before the first aircraft with trim tabs was available. Tests have proved that trim tab aspect ratio is comparatively unimportant since the ratio of tab chord to surface chord is of only minor importance.

Although the best position location for an aerofoil trim tab is at the tip, this presents structural difficulties and the next best location at the aerofoil root is usually chosen. Minimum aerofoil radius are of little effectiveness. Trim tabs are most effective at very small angles of deflection, their effectiveness decreasing to about 20 deg., after which their effectiveness is largely lost.

A trim tab should have a ratio of tab area to surface area of 5-10 percent.²

about of 18-20 percent and an aspect ratio of 5.10. To provide full aero statics, the gas slot below the cockpit has the wheel and tire displacement in degrees should be fairly large. Because this slot must be removable, gear case should be taken to prevent breaking, which can be prevented by the use of a line thread on the slot separating down.

Balance. The Data-Balancing tab lists the inherent characteristic of *it* using the effectiveness of a control surface to which they are attached. This then becomes a factor in a discussion concerning that of the aircraft. For this reason, a control surface must have a proper chord, span or maximum deflection in order to obtain the same lift effectiveness.

As in the use of the head tab, the mandibulo-chin balance tab that can be used with any chin control surface is limited by the condition that the tab should not be deflected beyond its 23 deg effective range.

One of the principal advantages of the balance tab is the fact that final modifications in the characteristics of the system, as indicated desirable by flight tests, can be made by altering the size of tab deflection through shortening or lengthening the link arm. The general requirements of size and shape given above for the trim tab are applicable to the balance tab.

A SINGLE MOTION 19



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or
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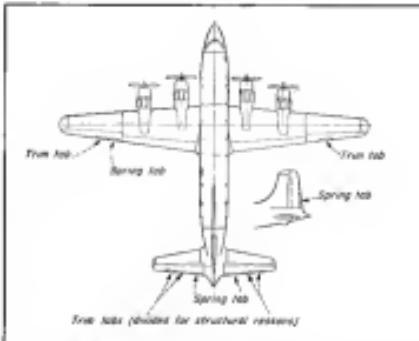
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► Tab Gap—Caps at tab bumps reduce the tab effectiveness and the reduction resulting from the tab gap is no large as to make an extremely narrow gap or even tab less desirable.¹ Tab effectiveness is sensitive to materials and surface con-

down, and is reduced by increasing the trailing edge angle, roughness of the surface to which it is attached, or any imbalance which tends to increase the boundary layer thickness near the trailing edge. (Cited in 1966)



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Exploring the unknown . . . in rocketry, piloted aircraft and guided missiles . . . is the important job of an able group of mathematicians, physicists, electronic, metallurgical and aeronautical engineers at The Glenn L. Martin Company. Revolutionary concepts of electronic guidance, instrumentation and navigation . . . delicate servo-mechanisms . . . spectacular power plants and powerful new fuels . . . are these health-taking tools.

REVIEW—Proposed by an angiologist among parts blanketed by color, painted by medical students. *Alberto Gómez* (1947) for the propagation reasonably. Here also the longest flights are achieved by polished aircraft painted with

LEFT—Filing rapidly, and composed of heavy marine limestone, will soon grow up as the velocity of 2000 miles per hour stretches the atmosphere and intense, howling, gale-force winds blow to the ground for future research. These mounting winds will go many miles beyond the F-20, which is maximum speed of 18,000 ft per second.

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AIRCRAFT

On the McDonnell XF-88 Jet Fighter ...



Safety Glass

BY PITTSBURGH



AN XF-88, the pressurized, transonically controlled aircraft, is shown in flight in the cold, twisted upper air. The aircraft is located at the test facility at Edwards Air Force Base, California. The aircraft is shown in flight in the lower and lower portion of the photograph.

strength with smooth finish consisting of multiple curved panels.

And we are continuing our aggressive development program, applying proven engineering principles to the solution of new problems as they arise. Over the years, we have amassed a priceless accumulation of glass-making experience. We have evolved unequalled production facilities. And they are at the disposal of aircraft manufacturers, large and small. Pittsburgh Plate Glass Company 226-9 Grant Building, Pittsburgh 28, Pa.

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When aircraft designers sought a closer approach to the aerodynamics vital in pilot cockpit pits and bombardier's compartments, Pittsburgh developed new and better glazing techniques which combine ample rigidity and structural

► **Spring Tab Use**—The spring tab acts like a spring in a force of twisted surface tension and is often compared to power-hungry control systems. By the use of spring tabs, substantially reduced force characteristics may be obtained even in large control surfaces such as ailerons varying in weight from about 16,000 lb to 180,000 lb or more.

It is theoretically possible to provide a value of stick force gradient in moments that does not vary with speed, no matter what aerofoil section is used. If the spring tab is used as a compromise with aerofoil section that has no variation of lift coefficient with angle of attack, the stick force C may be made independent of speed at any control-gravity location.

As a result of the analysis, increase in control force with speed, the tailing-aerofoil characteristic with a given control force may continue to increase with increasing Reynolds' number. Therefore, the principal design difficulties introduced by the spring tab involve the provision of adequate static tail strength to withstand these increased rolling velocities at high speeds.

Although the use of spring tabs may allow large deflections at high speeds, any danger of catastrophic loss of controllability effects or severe rolling distortion may be reduced because the moment surfaces need not be closely balanced.

► **Enclosed Spacing**—If the spring is a spring tab is included and any tab movement is damped preventively, a tab-tail control force is exerted, the control force characteristics for down below the payload are the same as those for a control surface without a tab. Also, at form above the payload the vibration of form with deflection is the same as that for a spring tab without preload. Thus, preload is an effective remedy for the stick-sensitivity of spring-loaded controls of tail surfaces.

An interesting application of the device is in the leading, or mid-point, control surfaces of the aircraft such as the mid-point jet fighter (led by Republic Aviation). The advantage of this arrangement is that at low speeds it may give greater control surface effectiveness per degree surface deflection than a surface without a tab.

One of the design problems with spring tabs is the fact that although the tab decreases the hinge-moment coefficient of the control surface for a given value of tab deflection increment, it accomplishes this at the cost of an increase in required stick deflection. This is because more control surface deflection must be produced to compensate for the loss of lift created by the deflection of the tab, and because part of the available stick travel is required to compress the spring.

► **Spring Tab Flutter**—One of the major problems posed by spring tabs in their susceptibility to flutter. This condition may be avoided in two ways, either and separately or in combination: (1) in excess the critical strength of the tab, or (2) provide tab mass balance.



Short-Haul Turboprop Transport

According to the theory that air transports will follow a pattern as related to aircraft size and weight, British recently have flown its first turboprop aircraft transport, the Handley Page Marlin. It is reported to be the largest aircraft ever to have been built.

The Marlin is a two-engine, turboprop aircraft introduced by the Spring Tab in the position of adequate static tail strength to withstand these increased rolling velocities at high speeds.

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Despite this increase in required deflection the pilot can attain deflections that he would not otherwise have the strength to achieve. Full stick deflection in full control deflection may be obtained in a given airplane to which a spring tab is applied by simply reducing the mechanical advantage of the stick. This will, of course, result in an increase in stick force for any given operating condition.

► **Spring Tab Flutter**—One of the major problems posed by spring tabs in their susceptibility to flutter. This condition may be avoided in two ways, either and separately or in combination: (1) in excess the critical strength of the tab, or (2) provide tab mass balance.

Increasing the strength of the tabs simply adds weight to the airplane. Mass balance also adds weight but could, in addition to aerodynamic balance, still further reduce the critical forces on the tail-control surface components. Although tabs with sealed internal balances did not substantially improve characteristics, aerodynamic mass balancing has indicated an effective means of reducing the control forces on spring-loaded control surfaces.

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Journal Publishing Co., Ltd., London,
England, 1941
Wright, K. W. Wind Tunnel Tests of
Vibrating and Rotating Structures. *ACM T&M*
11(1), 1208

Over, C. G.: "Kinetix" All the Worlds
Aircraft, 1939-1942. Stevens, New York, 1942

Over, C. G.: Circular Surface Flows
by Wind and Oscillation. *Proc. Amer. So. Mech.* 1940

Over, C. G.: Wind Tunnel Tests of the
Vibration of Airfoils. *Proc. Amer. So. Mech.* 1941

Investigation of Metal Plastic Cracks
in Accelerometers. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G. and Thomas, J. H.: *St. Ives*
Circular Surface Flows. *Proc. Amer. So. Mech.* 1941

Investigation of Stability and Control
Characteristics of Airfoils. *St. Ives* 1941, 30, 109

Investigation of Dynamic Qualities of
the Propeller. *St. Ives* 1941, 30, 109

Stability and Control Characteristics of
Airfoils. *St. Ives* 1941, 30, 109

Over, C. G.: Vibration of Wings
Measuring Acceleration. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
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Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

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Over, C. G.: Vibration of Wings
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Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
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Over, C. G.: Vibration of Wings
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in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
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in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

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Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

Over, C. G.: Vibration of Wings
in Wind Tunnel. *Trans. Acoust. Soc. Amer.* 1941, 30, 109

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Continental Air Lines celebrated its 15th anniversary in July. This transcontinental carrier is hardly proud of its celebrated record of flying 220,000 passengers more than 244,017,000 passenger miles without a single fatality. We are happy to have played a part in this great accomplishment.

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PRODUCTION

Cost Estimates for B-36 Program

Aircraft	Gov. Furnished Property	Total	Unit Cost
Original 48 B-36 aircraft year 1947-48 funds	\$114,911,160	\$114,911,160	\$114,911,160
Emergency modification of 1948	1,000,000	1,000,000	1,000,000
Emergency funding	41,404,100	110,414,100	110,414,100
Subtotal for 1948-49	\$116,915,160	\$116,915,160	\$116,915,160
1949 B-36 aircraft year 1949-50 funds	210,000,000	210,000,000	210,000,000
1950 B-36 aircraft year 1950-51 funds	210,000,000	210,000,000	210,000,000
Cost of design	1,000,000	1,000,000	1,000,000
Cost of experimental models	10,000,000	10,000,000	10,000,000
Total estimated cost	\$421,000,000	\$421,000,000	\$421,000,000

Summary of Termination Costs (Fiscal Year 1947-1949)

Termination costs	
Senate Officers Board (Dec '48-June '49)	\$16,497,637
Senate Officers Board (Feb '49-Mar '49)	522,962,385
Losses from Fiscal Year 1948 and Prior Periods	
B-54	\$8,322,121
YB-50C	6,536,000
F-47	1,161,928
B-12A	145,828
	16,979,878
Total	\$96,011,700

What the B-36 Is Costing USAF

Comptroller gives breakdown for original and repeat order, and shows financial effect of cancellations.

By Robert Hau

Revised figures on U.S. Air Force contract cancellations show the shift of approximately \$373 million in unexecuted contracts during the past nine months since the government's \$36,811,578.

These figures, as compiled by Lt. Col. Edward Rawlings, USAF comptroller, list the following payments irrevocably scheduled to the companies whose contracts were canceled or shifted:

• North American Aviation, Inc., \$15,667,943 out of contracts covering \$19,233,308. This covers cancellation of contracts for 36 B-49C jet bombers and 116 F-86A jet fighters.

USAF entered a contract for North American to build two YF-93A fighters at a cost of \$30,158,443. North American is now scheduled to get \$35,093,145 for settlement of the B-49 contract as contrast to \$12 million originally estimated by USAF. The F-93 contract settlement will cost \$464,115 in contrast to an original estimate of \$6,691,157. This leaves \$3,304,375 now available for new procurement from the B-49 settlement as well as another \$6,367,000 from the F-93 contract.

• Boeing Airplane Co., \$16,024,287 out of contracts totaling \$16,337,000. This is for the airframe contract for 48 B-54 VEF-powered bombers. Another \$8,799,307 will be required to settle contracts for government-owned parts to be used on the B-54. Cost of the B-54 is \$16,337,000. Funds \$32,863,188, leaving a balance of \$137,515 out of the \$32 million originally set aside for cancellation costs also chargeable to B-54 cancellation costs are \$65,468,000 from fiscal 1948 funds allocated for a YB-50C and B-54 prototype development. Boeing also received \$164,477,000 contract for an additional B-47 bombers which will require about \$5 million in additional equipment.

• North American, Inc., \$18,921,000 out of original contracts totaling \$112,300,000, to speed B-49 jet fighters using the B-125 as an interim aircraft. USAF is to speed \$16,353,800 for a prototype XB-49 jet aircraft. Cancellation of the B-49 contract will cost \$10 million, with the C-125 contract termination cost now set at \$668,137. This leaves \$13,736,000 of the original reserve set aside for terminating Northrop contracts, available for new procurement.

• Convair \$24,080 out of an original \$52,902,000 contract for the YT-52A, a high-altitude version of the Convair Line.

Also released from the cancellation is \$6,482,000 worth of government-owned equipment for the canceled aircraft that can be used in other aircraft now in production.

Convair Wright is scheduled to receive \$3,351,933 in settlement of its canceled contract for 54 F-86A night fighters and Bell Aircraft Corp. is expected for \$144,525 to cover a cutback in its X-12A helicopter contract.

Rawlings estimated total cost of the B-36 production program now stands at \$88,906,774 for 107 production models and one XB-36. About \$487 million of the authorized expenditure has been spent on B-36 production to date.

• Boeing in Total—Original order of 95 production models, B-36 bombers, is based on a unit cost of \$46,912,991 per plane, of which nearly half was government-furnished equipment. Modification of these planes with late model Pratt & Whitney Wasp Major engines, addition of four General Electric J-47 turboprops and the new K-10 seat loading system will add another \$3,356,294 per plane and boost total unit cost to \$51,268,686.

The revised increment of 75 B-36 bombers will cost each \$47,529,979 since inclusion of all of the equipment added to the original 95 planes. Write-off of production tooling for the original aircraft is largely responsible for the revised unit cost.

Original intercontinental bomber design competition was won by the B-52 in 1951, cost the Air Force \$415,621 of which \$308,365 was paid to Boeing for

NEW AVIATION PRODUCTS



Communication Aid

CAA-approved R-31 aviation amplifier, developed by Aerostat Radio Corp., Rosedale, N. J., is designed to permit operation of communication equipment by pilot and copilot without interference from each other.

It enables pilot and copilot to select one combination of 10 antennas, selective, microphones, etc., with complete independence of the other's choice. It also provides long speaker operation to both.

Company states an interference exists between the two channels regardless of switch selected by either pilot. Unit weighs 6.3 lb. and is approved under certificate 10R-61.



Pullers and Wrenches

Redesign of six "Presto" puller parts and addition of two new items is announced by Presto Tool Co., 3209 State St. Ave., Los Angeles 54, Calif.

Three series, for wheel and hub and wheel-disk pullers, have detachable non-cutting tips. Diesel cutter tips hold tip on screw and hinge it properly aligned.

Heavy-duty, film-drive steel puller

is adaptable for power tool use. Diameter and turning radius have been shortened and weight reduced from 40 to 21 lb.

Steel bearing puller has tapered, expanding end to give smoother operation.

New parts are 123 in short no. 45-5083, designed to prevent use of short handle puller in close places, and narrow puller no. 4907, for medium-duty pullers. Larger puller range tips and can be used for removing washers, gears, etc., which have seized sections for receiving narrow pull.



No-Flutter Antenna

Double antenna developed by National Aerostatic Corp., Wing Field, Andover, Pa., for use with Nimitz carrier range and, as subsequently modified, on aircraft.

Company states that after series of comparative tests, tapered, stainless steel rods were selected because of their resistance to fatigue during strong conditions.

The unit and patented are constructed of cast aluminum.



Cuts Heavy Cable

Portable, hand-operated cable cutter, offered by Beverly Sheet Metal Co., 3001 W. 111th St., Chicago, Ill., is designed to impact along, rather than pricking through, cable. It can cut through 1/2 in. steel cable in one stroke. Unit also is stated to be especially adapted to cutting hollow steel materials, steel and riveted cable, cable ties, heavy cable, tube, and conduit.

Unit is especially suited for cutting around sheet metal, aluminum, and plastic structures, junctions and blocks. It's claimed high-tension loads are easily accommodated. Serrator motor is precisely synchronized before any load is applied.

Other advantages claimed: Motors can be started closer to the impact point; reduced starting current; blocks are absorbed in air cushion. Supplied in standard foot mounted or pistol body form, cuts can be positioned horizontally or vertically and are available in 4 to 16 hp. sizes.



New Sparkplug

Single-electrode sparkplug, D-16, offered by Aviation Devices Corp., 13440 S. Central Ave., Los Angeles, Calif., is stated to give better spark in concentrated area and easier to adjust than multi-electrode sparkplugs.

Company claims plug has heavy-duty nickel electrodes and is claimed to have high resistance to heat loss of about 1000° F. Nickel electrodes which resist chip out, cracking, pitting and deformation. Its design is intended to permit speedy cleaning and replacement of parts.

Company states that at completion of CAA 200-hr. endurance test, comparative power curves showed generator was equal to other well-known plug.



Fluid-Drive Motor

For operating aeronautic, retractor, and bridge and hoist drives, a single, elegantly designed, electric fluid drive motor manufactured by Berkland Electric Co., Alhambra, Calif., is stated to offer savings in original cost and mounting space over conventional electric fluid drives.

Unit is especially suited for loads requiring smooth acceleration and deceleration, jerking and shocks. It's claimed high-tension loads are easily accommodated. Serrator motor is precisely synchronized before any load is applied.

Other advantages claimed: Motors can be started closer to the impact point; reduced starting current; blocks are absorbed in air cushion. Supplied in standard foot mounted or pistol body form, cuts can be positioned horizontally or vertically and are available in 4 to 16 hp. sizes.



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Operating speeds 100-1000



THE MCDONNELL XF-88 is now under development for the U.S. Air Force's "penetration" fighter, capable of operating deep inside enemy territory in a fighter-bomber

or bomber-role. It is a single-glass, twin-turbojet plane with a pressurized cabin, and weighs some 15,000 pounds, has a wing span of approximately 49 feet. Data restricted

What material helps make the XF-88 possible?

Answer: Aluminum The sleek-lined, lethal-looking McDonnell XF-88, with its very thin wings and tail assembly, wouldn't be practical—couldn't perform as remarkably as it does—without the use of light, strong aluminum.

Dozens of all modern aircraft are drawing upon aluminum's versatility more and more—to perform design miracles which step up the speed, strength and power of today's planes.

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production of Kaiser Aluminum—opening to manufacturers a dependable new source.

Today Permanente Metals contributes more than one quarter of a billion pounds of aluminum to the nation's supply. Almost as much as the entire country produced just ten years ago.

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SALES & SERVICE



MONZA, flown by Al Foss, was not fast enough, placed ninth



HEEDMAN "Fish" Salmon left the LeVier Monza, placed eighth

Midget Race is Close Contest

Brennan's victory credited to his "jockey" weight and good piloting; LeVier withdrawal gesture praised.

By Alexander McNaury

CLEVELAND—Hyper speeds and close competition again lead the 1949 Goodyear midget race the high point of the National Auto Races in many of the sports.

Bill Brennan, weight 166 lbs., piloted "Buster," the red Witman special, to a win at a new record speed of 177.34 mph. It was the Oaklader, Wit's, pilot's second triumph in the three years of the Goodyear Trophy race. He was at 177.37 and placed fourth in the 1948 race. His surprise, and his "Buster" car, also did "Buster," up the little channel track last year's except for the addition of new streamlined wheelsets. He and his team, the McCleary brothers, that built "Buster's" prop, believe that the light weight of the plane, which is mostly slightly fat, is part here, but also he stated not in doubt his general belief he decided it was up to him to win.

Witman and Brennan do not believe that they are getting the maximum performance possible out of their little sizes even yet, and are preparing additional modifications for next year. A new set of wings for "Buster" is nearly completed and will be installed probably before the planes go to Miami for the Continental Motors weight meet in January. Incidentally, both Brennan and Witman have won previously at Miami.

► **Concord Wind**—Two of the three Concord Wind type all-metal output planes built by LeVier and Associates, freight a imposed task race for fourth place, with Vincent Art in Palladium's green Bellanca barely edging out Jim "Fish" Salmon, last year's winner. Salmon had reverted his fuselage, tamping back the fairings as the cockpit went to the rear. The wing Salmon flew a "store-bought" one while Art flew a sheet directly over him, throughout the race and moved slightly to port here at the finish.

The plane owned by Terry LeVier, third of the Concord Wind, was left back as a semi-final heat, when it popped the canopy and Billie Robinson, the pilot was forced to withdraw from the race. LeVier decided not to race it in the consolation Goodyear race for planes eliminated in the earlier heats because its qualification speed had been so much higher than that of the other planes in the consolation.

LeVier had planned to use a special aircraft recovery system on "Little Terry," the one he had, and had planned that if it won the race he would be granted a year's extension of the Goodyear specifications, and was approved by the contest committee. Some reports said that it exceeded his plane's speed more than 10 mph. As a result of protests by the other pilots that the system gave LeVier too great an advantage, LeVier agreed to withdraw the system.

► **Autospeed**—Nate Pirotski included numerous letters written by Armando Wray, and later those of pilots who withdrew from the Goodyear race if LeVier did not drop his system. LeVier's systematic withdrawal to withdraw the system, after it had been ruled valid at within the regulation, was highly praised by the contest committee.

Sorenson's dash-home plane, unashamed winner in the Goodyear, was a plane which he and Mike Armando, another West Coast pilot and plane builder, had built before Armando was killed while flight-testing a midget designed by the late Art Chester. Then Sorenson, and Armando's widow, decided to complete the plane as a parting memento and as tribute to Art.

One of the most improved planes in the 1949 Goodyear was the sleek all-metal Felt special which went to the finish this year after winning its qualifying heat. Felt flew a good race in the final but his plane with its distinctive high stabilizer was still not fast enough to catch the Witman, Sorenson and Concord Wind planes.



"The unseen passenger" is a common occurrence on most transport planes. With due consideration to the take-off weight it is not always possible to carry the full complement of passengers, although empty seats are available in the plane.

"The unseen passenger" does not, however, appear on the Scandia. Under practically all conditions this plane can take the full number of passengers with luggage — in addition to a paying freight.



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Cruise Altitude	10,000 feet
Cruise Power	150 RHP
Headwind	10 MPH
ATA Fuel Reserve — Standard Atmosphere	100 miles

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SVENSKA AEROPLAN AKTIEBOLAGET - SAAB AIRCRAFT COMPANY - SWEDEN

AIR TRANSPORT



HERMES V, fourth and largest of Britain's stable of turboprop transports, has a 97-ft. wingspan and 84,000 lb. load by...



FOUR THIRLWAN engines which total 3000 hp. for takeoff

Britain Pushes Turboprop Liners

While pure-jet transports have stolen the spotlight, first airline order is for turbopropeller planes.

(McGraw-Hill World News)

Great Britain is making sure its new turboprop transports will not pay any and add to its, more spectacular, pure-jet services such as the de Havilland Comet.

The British late last month flew their fourth and largest turboprop plane—the Hawker-Paige Hermes V, which reportedly can carry the equivalent of 65 passengers and two tons of cargo.

Concurrently, British Overseas Airways Corp. and British European Airways announced they are entering into negotiations with Vickers-Armstrongs, Ltd., on a joint order for the 40-passenger Viscount, the world's first turboprop airplane.

As the British prepared to push turboprop development they cut some bureaucratic red tape.

at the U. S. commercial aircraft rating licensing industry.

► **Admiral**—Sir Miles Thomas, BOAC chairman, and the Airtonian system of mass production has an Admiral high. "It is less light of foot, less wasteful, adapting new techniques to its possibilities of mass production and economy. That should enable us in Britain to hold our ground."

Sir How Kiani, managing director of Vickers-Armstrongs' aviation division, declared that after 1952 piston-engined planes could be replaced in short-haul flights and that he, for one, expected the Airtonian to "fit up and replace the Comet before long."

First flight of Britain's newest turboprop transport, the Hermes V, was made at the Hawker-Paige airfield at Radlett, Hertfordshire. With Chief Test Pilot

H. G. Heselton at the controls, the ship flew for 30 minutes at about 2000 ft. The aircraft is described as "completely aerobatic" with the nose under control at a speed of 340 mph at less than full throttle.

► **Pioneers**—The Hermes V is a development of the Comet IV, with the four Bristol Hercules piston engines replaced by four Bristol Thrustor turboprops. This increases the takeoff rating from 5100 lb. to 4800 kg.

In other respects, the Hermes V is markedly advanced with the IV, which made its first flight about a year ago. Both have a maximum payload of 17,000 lb.

While two prototype Hermes Vs have been ordered by the British Ministry of Supply, an express aircraft to test further the possibilities of turboprop-powered transports, it is no secret that Hawker-Paige would like to cultivate a few orders from airline operators. Until these orders are forthcoming, no production is contemplated.

► **Hermin IV**—Meanwhile, production of the 25 Hermes IVs on order for BOAC is nearly completed, with delivery of the first of the order expected this month and the remainder by the end of 1949. British Railways have been given a 1000-hp. version of the same aircraft, and the Royal Air Force has ordered 1000 aircraft.

The Hermes IV, which is fully pressurized, is intended for operation along BOAC's Empire route at altitudes of 16,000 ft., where it is designed to cruise at about 300 mph with a range of 1100 miles. Maximum gross weight is given as 51,000 lb. but may be higher by the time the plane goes into service.

By contrast, the maximum gross weight of the Hermes V is 84,000 lb., and its cruising speed at 30,000 ft. is 325 mph. Rate of climb at takeoff

Mamba memoranda

No 10

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a 2000 ft. per minute. Dimensions of both the Hercules IV and V span 111 ft., length 97 ft., and wing area 1908 sq. ft.

► **Vincent Order.** Number of Vickers Viscounts ordered by British government-owned airlines has not been disclosed. But it is understood that BEA will take 10 and BOAC "about a dozen." BOAC proposed order, on behalf of its associate British Overseas Airways Corporation, for 10 aircraft. West Indies Airways

BEA has recently turned down the Viscount in favor of the Armstrong Whitworth pressurized aircraft. Twenty Armstrongs are on order and are expected to go into service by 1951 on BOAC's transatlantic services寂寞

Will NWA's Boeings Pay Their Way?

CAB vice chairman Ryan voices negative opinion on use of 377s by carrier on transcontinental-Orient service.

A \$15 million question mark is hanging over the Boeing Stratocruiser as transcontinental service by Northwest Airlines this month.

Majority of the Civil Aviation Board staff believe the ten double-decked transports purchased by NWA will promote convenience and efficient service. But the Board's vice chairman, Oswald Ryan, has added his voice to those contending that Northwest's management may have made a mistake in acquiring high-capacity planes costing \$3 million each.

► **Loss.** Stan Conroy—NWA's man in the Board—early in 1948 six months ago, the company asked Reconstruction Finance Corp. help in swing a \$12 million back loan to be used primarily for the Stratocruiser purchase.

It is the financing arrangement (in which RFC's commitment may be a maximum of \$12 million) that has opened the way for attacks on NWA's Stratocruiser program. Last May, a government financial expert appearing before the Senate Interstate and the Commerce Committee said that CAB should veto NWA's proposed RFC loan because the money should be used to less costly planes for operations over the trans-Atlantic route.

Despite this protest, CAB in a split decision endorsed the RFC loan to Northwest. And now, hopefully, the Board has issued an opinion settling both the reason for its action.

► **Majority Opinion.** The CAB majority, including Chairman Joseph J. O'Connell, Jr., and members John Lee and Russell Adams, and re-appointed U.S. commissioners with teeth of modest assault (such as the Stratocruiser) is clearly favorable and con-

cerned about the public interest. These planes, for the most part, will be fitted out to carry 46 or 49 passengers.

Vickers Viscounts, which dragged the Viscount for similar services with first Rolls Royce Dart turbine engines, caused enough ill-will to postpone and then postpone the project for a year. Later, when the Stratocruiser's design was modified to carry a greater number of passengers, it was first modified very soon, turned the Viscount 200, which will be built under the new order. Estimated delivery date is 1951.

There is no Viscount 200 in existence at the moment. But the prototype Viscount made its first flight in August last, flew more than 230 hr.

concerned about the low rate the CAB would go in issuing repayment of the loan, the Board made clear that its approval of the deal does not guarantee to Northwest any more and compensation than the carrier would be entitled to otherwise. It did agree to have RFC loan documents don't constitute a formal commitment by the Board to undertake automatically later action by Northwest with respect to the Stratocruiser.

"All new aircraft are experimental in nature, both with regard to their technical and economic aspects. If it develops that the equipment is not suited for the purpose for which it is designed, or that there is too much of it, the dictates of commercial and efficient management require that the carrier correct the situation either by disposal of that or other equipment or by reducing rates," said the Board.

► **Conroy's Position.** CAB said that the Stratocruiser "should be able to meet certain basic requirements under which it has been laboring for 18 months because its proposed transatlantic placid modern four-engine equipment (such as Constellation and DC-6) is paralleling domestic routes." The opinion noted that competitors also are in the process of putting new four-engine planes on high-priority Northwest's international operations.

NWA plans to put five of its ten Stratocruisers in domestic service, three on the Orient run and two on the West Coast and Mexico lines of the airline.

► **Ryan's Response.** In his dissent, CAB Vice Chairman Ryan said Northwest



FLIGHT ANNOUNCEMENT JUKEBOX

Airline dispatchers of Seattle-Tacoma Air port use a newly developed push-button public address system for announcing incoming and outgoing flights. Each flight announcement, coded by letter and number, is heard in a small remote control box at each of the eight gates. When the cabin attendant needs a flight, he pushes two buttons on the box, releasing the proper recorded announcement over the public loudspeakers. Heart of the system is a 100-selection Seeburg player. One announcement is cut on each side of a 10-inch reel. At present 80 records are used to cover the needs of Delta, Pan Am and Northwest. It is estimated that the new device will save \$1400 monthly over comparable systems employing the services of live operators.

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is in a most difficult position by reason of the Statewater's proposal of the RFC's amendment, as the Board is to understand, the Stinsons through and over again consider as one of the planes under former and efficient management for a reasonable bid period may result in increased financial needs by Northwest.

"Normally an airline should take the risk that selection of new equipment which has the effect of increasing and pay requirements may be found unnecessary, with the resulting lighter expense disclosed by CAB. In the present case that risk is eliminated, because by approving the RFC deal the Board has in effect found that Northwest's bid is reasonable in regard. Stinsons' bid was not selected.

Ryan agreed that the Stinsons' plan gives even promise of making a sensible contribution to international—and possibly domestic—air transportation. But he pointed out that the ship's load per available seat mile is only significant if there are passengers to fill the seats.

► **Traffic Density Cited**—On its international route to the Orient, Ryan declared, SWA averaged only 13.5 passengers per mile in 1948—hardly a respectable load for a DC-4, much less a Stinson.

In the first quarter of 1949, Northwest reported load on its new Seattle-Honolulu run was 31 passengers, and Pan American's load on the route was about the same. Yet, Ryan noted, both Northwest and PAA plan to use Stinsons between Seattle and Hawaii, even though their combined traffic could be handled easily by a DC-4.

Domestically, Stinsons are equally unsuited for Northwest's operations, Ryan declared. He observed that SWA's passenger traffic per mile of route mile is less than one-half that of United Air Lines. "Under these circumstances of heavy competition, at least to insure Northwest's retention of the largest equipment available."

Travel Tax Evasion

Bureau of Internal Revenue has taken steps to halt widespread evasion of the 15 percent U.S. transportation tax.

The agency ruled that month that the tax on passenger tickets bought in the U.S. applies to the landing of loads outside the country for purchase of transportation uniformly subject to the U.S. levy. During recent months, purchase by Americans of airline, rail and bus tickets in Canada and Mexico has become a thriving business. ► **Low Explanations**—Specifically, the Bu-

reau of Internal Revenue's pronouncement said: "The 15 percent tax is due even if persons mail or telegraph or send cable, money orders or other funds to ticket offices, travel agents, etc., in other countries for tickets covering transportation in the U.S. The tax is also due if Americans average such travel or transportation often in this country for the benefit of such foreign persons or firms."

Examination of the U.S. transportation tax became a popular practice after Canada repealed a similar levy earlier this year. (AVIATION WEEK, May 16). Bureau of Internal Revenue officials privately had indicated that such tax would they could do to up the evasion, and that in considerable doubt that the new ruling can be enforced effectively.

Feeders Ready

Turner and Bonanza plan scheduled DC-3 operations this fall.

Two more short-haul carriers, one in the midwest and the other in the west, plan to inaugurate regularly scheduled operations with a conventional transport-type equipment this fall.

Turner Airlines, Inc., Indianapolis, hopes to begin service over its feeder routes within the next month, using 21-passenger DC-3s. The company's two main bases are Cincinnati and Grand Rapids, Mich., and both Louisville, Ky., and Chicago, Ill., initial operations. One nonstop daily will be made from midwest portion of the system—from Indianapolis to Chicago and Grand Rapids.

► **Nevada Carrier-Bonanza Air Lines**, Las Vegas, Nev., plans to start scheduled operations between Reno, Nev., and Phoenix, Ariz., with 20-passenger DC-3s by November. The carrier has been operating regular nonstop service between Las Vegas and Reno since the summer of 1948 but was not granted an interstate certificate until last June.

CAB recently approved creation of Bonanza Air Lines, Inc., of Bonanza, Tex. The franchise was originally issued to Bonanza Turner Aviational Corp. in February, 1948, but previous plans to inaugurate service under it fell through because of financing difficulties.

President of Turner Airlines is Col. Robert Turner, and Fred and Fredie have operator H. Paul Wessner, president of Northwest Air Transport Service, a Mountainair contract and non-scheduled carrier, in executive net position and assistant operating head of Turner Airlines.

The Indiana's certificate is now scheduled to expire on Feb. 6, 1951. ► **Stock Distribution**—The agreement transferring the feeder certificate provides that Bonanza Turner Aviational Corp. will receive 20,000 shares, or 25 percent of the outstanding stock of Turner Airlines for the franchise. Post Office, telephone, equipment and maintenance costs owned by Northwest Air Transport Service will be made available to Turner Airlines by Wessner interests in exchange for 60,000 shares (the remaining 75 percent of the outstanding stock) of the feeder company.

In approving the certificate transfer, CAB specified that Northwest Air Transport Service must surrender its letter of registration to a large irregular carrier within six months and must not engage in any air transportation thereafter. In the alternative, the Wessner family interests must close themselves off from all Northwest Air Transport Service to eliminate any connection between Turner Airlines and the related affiliated operations.

► **Contract Operations**—Northwest has been operating as a contract carrier since February, 1948. It has had contracts with the Department of Agriculture to fly farm workers recruited in the Caribbean area to the U.S. and home again.

U.S. Immigration and Naturalization Service has said Northwest to transport deportees (mostly Latin Americans) and their own constituents. The carrier maintains two subsidiaries in Mexico and Guatemala, which are engaged in general air transportation and overflights.

Recently Northwest has been flying, especially, short-haul routes in other major—on a non-scheduled basis—between points within the U.S. and between Mexico and the U.S.

CAB and it is realized that to require Northwest to dissolve its non-scheduled operations would probably result in a heavy loss to the company. But the Board believes it is not in the public interest to approve creation of a feeder by a large carrier in its center.

► **TWA-Bonanza Deal**—Early activation of Bonanza Air Lines' interest on CAB's part was held up because the carrier was unable to file with TWA's Phoenix, Ariz., office. The management could continue for the life of Bonanza's first post temporary certificate or for as long as Bonanza holds its CAB franchise.

In terminating Bonanza for a certificate late spring, CAB and the franchise would not be issued until the carrier made a satisfactory agreement with TWA to take over the Phoenix-Las Vegas operation and until the Nevada company could show it had adequate financial resources. Total of adequate financial resources will be made available shortly, Bonanza president Edmund Conner told the Board.

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SAN FRANCISCO AIRPORT

BEA's First Profit

(McGraw-Hill World News)

LONDON—July was the first month British European Airways made a profit since the airline was organized (April 1, 1946). Aeronautics Agency, Ltd., reported. March 31 losses net to show a profit over an entire year, and this is expected to be the case also with the year ended March 31, 1949, for which report has not yet been released. However, BEA is more hopeful of the outlook for a profit over the whole of the current fiscal year.

British Overseas Airways Corp. has yet to show a profit on any annual total, covering the airline as a whole. Its Atlantic line, however, has been more than paying its own way and its full share of the overhead, for some time. British South American Airways showed a small profit in the first year of operation which was reflected in its annual year's report.

Costs Reduced.—While the July 30 cutting profit is, perhaps, partly due to the seasonal decline of high traffic, two other reasons have made significant contributions to the reduction of costs:

• Rigid control over expenditures and the avoidance of overstating net costs, under the advice of guides

and management-efficiency consultants. Committee's reflection in effect much has resulted.

• A bonus-incentive scheme for BEA's aeronautical workers, introduced toward the latter part of 1948, is to be held to be unique among airline operations.

Dutch to Suspend

AMSTERDAM—KLM is considering suspension of its domestic Dutch air lines, possibly continuing indefinitely, because of heavy competition from road transportation over the short distances.

Dutch government intervention stopped a previous KLM attempt at suspension, but the case will definitely stop domestic operations at least for the winter. KLM recently cut its half the fares on its domestic lines.

Equipment Change

Westway Central Airlines plan to acquire long-distance—probably DC-4s—air freight equipment early next year, according to Hal C. Carr, vice president. The company now uses six Lockheed Electras.

Over and the decision to let WCA's fleet capacity installed four very comfortable planes in passenger traffic.

SHORTLINES

► **Aero Transportes, S. A.**—The Mexican domestic airline has asked the government's permission to operate from Mexico City to Monterrey, Tex., from Mexico City, Washington and New York. Company also has DC-4s for freight and coach-type service. If the Mexican government approves, ATSA will seek CAB for a foreign air carrier permit.

► **American—Air Line Transport Air** has negotiated a contract with AAU calling for an average \$13 monthly increase retroactive to April 16. New scale ranges from \$375 a month for the first six months to \$375 a month in the seventh year.

► **BOAC**—The overseas corporation will, pending the merger of British Overseas Airways Corp. and British South American Airways, have been signed by the King. Effect date is dependent on completion of negotiations for transfer to BOAC of rights and property held by BSA as long as these exist.

► **Capital-Spart**—A issue of Sabadell Young Post carries an article on J. H. Caswell, Capital's president, under the title "He Wants to Make Money on an Aeroplane." Company reported a net profit of \$256,161 in 1948 and operating profit of \$200,500. Net profit for first seven months of 1949 represented a \$663,100 improvement over the same period in 1948.

► **Chilean Southern**—Has delayed a dividend of 15 cents a share. Company's net income for first six months of 1949 was \$134,621, or 15 cents a share, compared to \$307,635, or 31 cents a share, for the same period last year.

► **Mid-West Airlines**—Is now the official name of Iowa Airplane Co., Des Moines. CAB recently awarded the fitter's certificate under the new name.

Comair still hopes to start service in Iowa, Nebraska, Minnesota, and South Dakota shortly with mid-size aircraft. Comair's first fitter's CAB certificate that an F-47D will be issued and extended three full years after Sept. 1, 1949.

► **National**—Reports that about 20 per cent of its revenue has since been been from nonstop executive flights. Perhaps explains plane NAL's net profit for first half 1948 at \$566,600, compared with a net loss of \$1,849,463 in the same period last year when a strike cut in profits.

► **The American**—Plans to cut fares to Alaska up to 25 percent between Dec. 1 and Mar. 15.

► **Pioneer**—Has been advised by the Texas airfield general that it may have

the new project of Army
Air Force, which is to be
located in the vicinity of
Casper, Wyo.



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to DC-3 operators who will require additional
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have been signed with airlines throughout the world to absorb the basic productive capacity of Steward-Davis for the coming year.

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Therefore no more overhaul contracts at \$1895 exchange will be made available.

However, Steward-Davis now offers an additional productive capacity of 50 newly overhauled 600-hour warranted R-1830-92 engines for delivery as desired by purchasers at an increased price of \$2295 each, exchange—L.A. Gardena, California.

Sales from this block of fifty engines will take place on a "first-come, first-served" basis.

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EDITORIAL

Dangerous Exhibitionism II

A leading pilot is dead. So are a mother and her young son, trapped in their burning house after Bill O'Brien's men rapped through it. These losses are dead and aviation has another tragic blot. And for what? There is no valid reason.

The National Air Races now longer serve any useful purpose in these days of remarkable research and laboratory facilities. Some such tragedy as this was bound to happen. It was inevitable. The mistake is that the death toll was not larger.

As long ago as August, 1946, *Aviation Week* (our predecessor) was so disturbed "because for the 'blown' and you believe the 1946 races 'How many' are not able to fly in light aircraft" by the Thompson Trophy Races that "we can continue to proceed, continue to live, and other interested persons you will read about in our newspaper's" biggest headline type the morning after.

They were lucky that year. And for several years thereafter, And the national brought no judgment from Cleveland.

This was the case of protest issued out of Cleveland as of another kind. They are less often than leaders who demand and end to such needless shooting out from the bushes.

There is no issue that has not been band publicity as concern on the tragedy of Cleveland, and that is strange. For it is the issue of the National Air Races which probably justly prints its poster in "national" and approves arrangements the creation of which is of my kind.

Besides of that long recognized absurdity, it could well be that the ultimate responsibility for what happened at Cleveland is NAAA. The promotion of the National Air Races here in their primary interest the promotion of taste in Cleveland and revenue for the organization (let us suppose he builds the city in an amateur center).

NAAA has been proclaiming as right to speak for "the public interest" that the public interest is in private aviation. It is up to NAAA to decide whether to continue to do this kind of two percent in their issue because we need not feel any remorse. This would be as high powered sense without NAAA's comment. At one time as the recent history of that organization, same as NAAA felt that such men as the Thompson should be disbarred. They were succeeded. After all, the less warning to NAAA from members of the race was a better.

If NAAA has no proposal to guard against a repetition of last month's tragedy it has forfeited an right to speak for this country for the Federation Aeronautique Internationale (the world governing body of contest sports), and perhaps for the public interest in aviation.

Aviation's toughest problems—part, present and future—a public and a national. As was pointed out here only last July 11, "Our engineering specialist section does more harm in a minute than months of protest, and ignorant education. Safety of life is the foundation of aviation, and its future. Those who are willing to take a chance with human life unconsciously are no friends of aviation."

Truth About Britain

What can you believe at all this politeness about Great Britain's remarkable achievements in jet aircraft design and construction? Is Britain ten years ahead of the United States?

Readers of *Aviation Week*, as so often as the part, are in for some interesting copy. We have sent Robert Shultz, our news editor and *Avionics* and *Naval* writer from Washington to our liaison with *Aviation Week*, McGraw-Hill's chief correspondents in England.

We expect this team to produce some of the most important editorial and business intelligence reports you will find in print anywhere this year. The series will start shortly, with a comprehensive summary of the 1949 British Aeronautical Exhibition at Farnborough, and a series of jet fighter and transport plane reports have been received. Later a stream of special reports will flow in from London and elsewhere in the Continent, on other top priority aviation subjects.

We believe *Aviation Week* is the only publication in the United States which has sent as many reports from America to cover the Farnborough show. Mr. Shultz is fully accredited as a correspondent by both the Department of Defense and the Office of the Secretary of the Air Force. Numerous other special and liaison officials were appointed but declined in the interest of security reporting, which shows best what there are no foreign intelligence.

Mr. Holt leaves without any special instructions that he is to write the truth as he finds it, in the best tradition of the free press of the country. He means no warning about flying from those who are meeting but need officials who wish to talk only "off the record." *Aviation Week's* reports may prove to be unpopular or controversial in certain quarters, both here and abroad, but they will be accurate, and they will be read and heeded.

It is with some pride—prideable, we believe—that *Aviation Week* offers its readers the special series.

Throughout the magazine's short life of hardly more than two years, it has set one important business paper precedent after another, and has taken a commanding first place in the U. S. aviation publications field. Reader (and advertiser) response to the power has been gratifying to a head-winking staff.

Our sales department says we are now monthly twice as many advertising pages as the 360 U. S. aviation medium. Our circulation people are happy about what they say is the fastest rising renewal rate (percentage of old subscribers who renew) in the business.

And a high percentage of our readers are not content with renewals for just one year. They are buying for two and three years. Because the circulation still is strong for economic reasons at close to 30,000, there is actually a waiting list of some new subscribers. Satisfaction of previous readers the business of writers are not simple. This, we say, makes our readership but a much more valuable audience for advertisers who are concerned about talking only to people in the industry.

Speaking of readership, surveys conducted by independent research, advertising, and audience organizations show a much steeper trend the past year in *Aviation Week* as rates for "first choice" magazine in this field. The last election conducted in the engineering departments of nine of the largest West Coast aircraft companies showed 94 first choice for *Aviation Week*, against 84 for *Flight* (the Magazine B, the second ranked).

The only answer we can think of to this response is to make *Aviation Week* ever better. So several announcements of new editorial series will be made in the new future.

ROBERT H. WOOD



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1. "Lucite" is crystal clear—means you can see specifications on optical surfaces—precision machined slides for periscopes.
2. "Lucite" is strong and tough—means strength P. 2,000 P. S. I.—tensile strength 10,000 P. S. I.
3. "Lucite" is light in weight—means

merely one-half the weight of glass.

4. "Lucite" protects precision—means
"Lucite" blocks out most incoming rays.
5. "Lucite" resists warping—means
factured to straight, true and even.
6. "Lucite" is workable—can be formed,
drilled, bored and formed like sheet
metal, even on vertical special tools.

If you need a transparent material for
enclosures in allied areas, keep "Lucite."
"Lucite" transmits 84-87% of visible light
and is lighter in weight than paper
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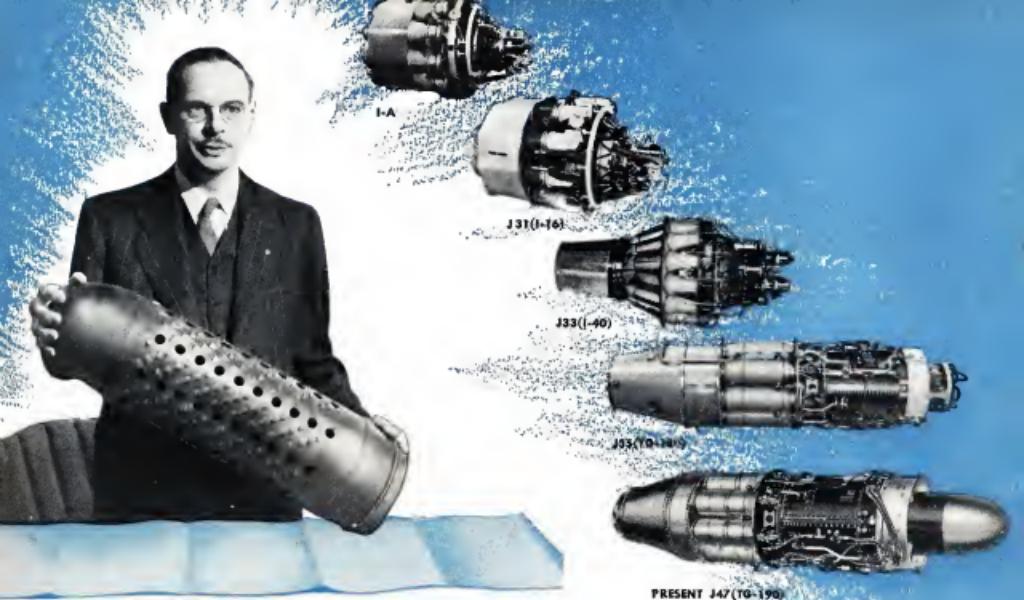
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He designed the I-A and I-16 engines which powered Bell's P-59—the first jet-propelled plane in the United States. He supervised the design of the I-40 engine—power source for Lockheed's F-80 "Shooting Star." In 1945 he took over further development of the J35 engine originally designed in Schenectady. Shortly after, he supervised design and development of the J47, one of the most powerful jet engines in production. The J47 furnishes power for North American's F-86 and B-45A, Boeing's B-47, Republic's XF-91, and supplements G-E turbosupercharged piston engine power in Convair's B-36.

Many G-E engineers such as "Truly" Warner are working today to provide new and better products for you and the aviation industry. Your nearest G-E representative will describe in detail the aviation products we engineer and manufacture. See him today. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

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